

**Seatex Seatrack 330
Seatrack VCU 300**

Technical Manual

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1 INTRODUCTION

The Seatrack 330 is an extremely robust GPS transponder developed for seismic survey operation. A built-in damping mechanism is developed to reduce shock exposure to the electronics including the GPS antenna.

The environment on a seismic source is extremely challenging for all types of electronics. Firing the air guns may cause high-energy shocks of more than 50G with 10 ms duration. Repeated every few seconds, day and night, for periods of several months gives new meaning to the term shock exposure. Seatrack 330 is designed to withstand this harsh environment.

The electronics is fitted into a steel compartment, which is further protected by a double polyethylene housing. This makes the Seatrack 330 resistant against all types of shocks and it is waterproof down to 20 metres.

Mechanical protection is not enough. Shocks of more than 20G will normally cause temporarily loss of lock of the GPS satellites. This ruins the position accuracy especially when using carrier phase measurements or RTK.

A damping method reducing the high-energy shock exposure of the GPS antenna and the receiver by more than a factor of 2.5, is developed. This enables the Seatrack 330 GPS receiver to continuously maintain track even during firing of the air guns.

Seatrack 330 tracks the position of distributed objects relative to that of a vessel. The Seatrack 330 unit is attached to the object to be measured. The transponder captures GPS L1 carrier and phase code and transmits it to the host vessel via a serial line.

1.1 About this manual

The purpose of this manual is to provide the user with sufficient information to operate the Seatrack 330 unit.

This manual is organised into the following chapters:

Chapter 1 **Introduction** - A brief introduction of the unit and an overview of this manual with abbreviations and acronyms.

Chapter 2 **Technical Data** - Describes detailed product specification, physical dimensions, required power and environmental restrictions, together with restrictions in use and guarantee.

Chapter 3 **Equipment Description** - Describes the system parts.

Chapter 4 **Operating Instructions**- Describes system configuration, installation and operation.

Chapter 5 **Troubleshooting** - Contains some hint for troubleshooting.

In this manual the following notations are used:

CAUTION

Is used to make the user aware of procedures and operational practice which, if not followed, may result in damage to the equipment.

Note A note text has this format and is used to draw the user's attention to special features or behaviour of the equipment.

1.2 Abbreviations and acronyms

ECEF	Earth Centre Earth Fix
GPS	Global Positioning System
HHT	Handheld Terminal
PDOP	Position Dilution of Precision
RTK	Real Time Kinematic
SN	Signal/Noise Ratio
SV	Satellite Vehicle
TBD	To Be Defined
TBID	Tailbuoy Identification Number
VCU	Vessel Control Unit
PPS	Pulse per second

1.3 References

[1] *Seadiff version 7.05 Differential GPS Software User's Manual, Seatex 1998*

2 TECHNICAL DATA

2.1 Health and environment

Operation or troubleshooting of the Seatrack 330 will not imply any risk of high voltages, explosions or exposure to gas. The Seatrack 330 unit is in conformity with EN 60945 standards regarding product safety (low voltage). Seatrack 330 must use a dedicated 12 V DC power supply compliant to Low Voltage Directive 73/23/EEC and product standard EN 60945.

2.2 Restrictions in guarantee

The liability of Seatex is limited to repair of the Seatrack 330 only under the given terms and conditions stated in the sales document. Consequential damages such as customer's loss of profit or damage to other system traceable back to Seatrack 330 malfunction, are excluded. The warranty does not cover malfunctions of the Seatrack 330 unit resulting from the following conditions:

- a) Over-voltage or incorrect power consumption.
- b) The Seatrack 330 housing has been opened by the customer.

2.3 Performance data

Position accuracy: 3 m (2D, 95%)
Update rate: 1 Hz

Excessive multipath, GPS signal obstructions or interference will reduce the performance.

2.4 Physical dimensions

Seatrack 330

Weight: 3.40 kg
Diameter: 101 mm
Overall diameter: 113 mm
Length: 400 mm
Colour: White

VCU

Width: 482 mm (19-inch rack)
 Height:44.5 mm(1U)
 Depth: 350 mm
 Weight: 3 kg
 Colour: Front plate, black

Junction Box

Width: 482 mm (19-inch rack)
 Height:44.5 mm(1U)
 Depth: 350 mm
 Weight: 3 kg
 Colour: Front plate, black

HHT

Width: 109.3 mm (4.3 inches)
 Height: 162.5 mm (6.4 inches)
 Depth:25.4 mm (1 inch)
 Weight:0.283 kg (10 oz)

2.5 Power

Seatrack 330

Input voltage:9-13 V DC
 Power consumption:2.7 W

CAUTION

*The Seatrack 330 unit must use a dedicated power supply. The requirement is 12 V DC/1A.
 The power supply could be:*

1. *Battery*
2. *DC/DC converter*
3. *AC/DC converter*

The power supply should be EN 60945 compliant.

VCU

Input voltage:100-240 V AC

Junction Box

Input voltage:100-240 V AC

HHT

Input voltage: 5 V DC

2.6 Environmental specification

Seatrack 330

Enclosure material: Polyethylene
 Enclosure protection: IP 68, 20 m
 Operating temperature range: 0°C to +70°C
 Storage temperature range: -30°C to +70°C
 Humidity: Max. 100% fully sealed

VCU

Enclosure material: Aluminium
 Enclosure protection: IP 21
 Operating temperature range: 0°C to +55°C
 Storage temperature range: -20°C to +60°C
 Operating humidity: Max. 95% non-condensing
 Storage humidity: Less than 55%

Junction Box

Enclosure material: Aluminium
 Enclosure protection: IP 21
 Operating temperature range: 0°C to +55°C
 Storage temperature range: -20°C to +60°C
 Operating humidity: Max. 95% non-condensing
 Storage humidity: Less than 55%

HHT

Operating temperature range: 0°C to +50°C
 Storage temperature range: -20°C to +70°C
 Humidity: 5% to 95% RH non-condensing

2.7 GPS receiver

Seatrack 330 and VCU

Type: Ashtech G12-L parallel channels
 Frequency (reception only): 1575.42 MHz ±10 MHz

Integrated Doppler can be utilised internally in the GPS receiver to smooth the pseudo-range measurements. An other option is to send raw pseudo-range and phase measurements.

2.8 GPS antenna

Seatrack 330

GPS antenna: Trimble Hardmount

2.9 Connector types

Seatrack 330

Standard

HHT and power connector:QXA 4/12 male pigtail

Optional

HHT and power connector: AGM-17x4F

Junction Box

Interfacing to the Seatrack 330 units:Amphenol Tuchel C091A, 4-pin female

Interfacing to the VCU 300: 25-pin D-sub male

Specifications subject to change without prior notice.

3 EQUIPMENT DESCRIPTION

3.1 Seatrack 330 description

The Seatrack 330 consists of the following parts:

- a motherboard for the electronics and a DC/DC power supply
- a processor module
- a GPS receiver
- a GPS antenna
- discs of damping material
- a steel cylinder
- a plastic pipe
- a connector
- a bottom plate
- interconnecting cables

In addition to the Seatrack 330 unit, a handheld terminal (HHT) with cable and connector can be delivered.



Figure 1 Seatrack 330 housing

The internal assemblies are shown in Appendix A. For optimum reliability, all electronic components including the antenna are located in a splash proof polyethylene housing. A steel cylinder houses the GPS receiver, the motherboard and the processor. The antenna is placed on top of the steel cylinder. The steel cylinder is free to slide up and down in the plastic pipe when subjected to shock. Above and below the steel cylinder there are discs of damping material.

When leaving the assembly line or maintenance at Seatex, the unit will be filled with nitrogen to prevent internal condensing.

Power and, if available, HHT are connected via the QXA pigtail connector at the bottom of the unit.

3.1.1 Differences RS-232 / RS-485

The Seatrack 330 can be delivered with either RS-232 or RS-485 serial lines.

When using a unit with RS-485, a Seatrack VCU 300 is necessary. Eight Seatrack 330 units with RS-485 serial lines may be used simultaneously on one VCU 300. The Seatrack 330 units with RS-485 must be set up with different slot numbers, see section 4.3.5. Seatrack 330 units with RS-232 do not require slot number.

It is not possible to use an HHT on a Seatrack 330 unit with an RS-485 serial line. The HHT is only capable of transmitting and receiving ASCII characters via an RS-232 serial line.

However, it is possible to use an HHT on the VCU 300 unit on Port 1.

On a Seatrack 330 with RS-485 it is not possible to upgrade the unit with new software when the unit is enclosed. For a software upgrade, the unit must be opened and a special cable must be connected to the motherboard.

3.2 Seatrack VCU 300 description

The Seatrack VCU 300 unit comprises the following main parts:

- a motherboard for the electronics and the DC/DC power supply
- a processor module
- a GPS receiver
- interconnecting cables

The VCU components are assembled in a 19-inch, 1U (4.44 cm) unit for rack mounting.

In addition, a GPS antenna and antenna cable is needed for the VCU system.

The GPS receiver inside the unit is used to synchronise timing between the VCU, the Seatrack units and the computation device, e.g. Seadiff.

Note If a GPS antenna is not connected to the VCU, an external PPS pulse must be connected to the unit. The pulse shall then be input via port 2 at the rear of the VCU. For configuration, see section 4.4.2.

The purpose of the LED indications on the front panel is as follows:

PWR This LED is lit when the main power switch is set to ON and power is supplied to the unit.

Note If the Seatrack VCU 300 unit receives a PPS pulse on Port 2, the power LED will blink off every second.

- RXD This green LED is lit when the unit receives data.
- TXD The yellow LED is lit when the unit transmits data.



Figure 2 Front panel of the VCU 300

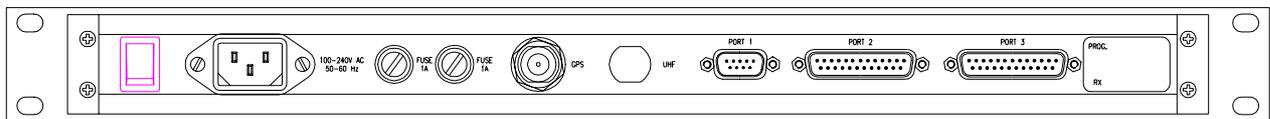


Figure 3 Rear panel of the VCU 300

The VCU may receive data from up to eight Seatrack 330 units with RS-485 serial lines. If more than eight units are used in the configuration, additional VCUs can be used in parallel. The VCU receives data on port 3.

3.2.1 PPS signal

A 1 pulse-per-second (1PPS) signal shall be input to the VCU via port 2 if there is no GPS receiver inside the VCU or/and no GPS antenna is connected to the VCU, see section 4.4.2 for pin configuration. The PPS signal adjusts the CPU clock so that data transmittal starts in the correct time slot.

The input voltage and current requirements for the PPS signal is 4.5 - 5 V and 10 mA. The PPS signal shall have a pulse width at 1 ms. The VCU triggers at the first rising or falling edge.

If a GPS antenna is connected to the VCU, no external PPS pulse is necessary. The GPS receiver inside the VCU will then synchronise the CPU clock.

3.3 Seatrack Junction Box description

The Seatrack Junction Box comprises the following main parts:

- four DC/DC power supplies
- a terminal block
- interconnecting cables

The Junction Box components are assembled in a 19-inch, 1U (4.44 cm) unit for rack mounting.

The main function of the Junction Box is to power up to eight Seatrack 330 units and to transfer data between the Seatrack 330 units and the Seatrack VCU 300.



Figure 4 Front view of the Seatrack Junction Box

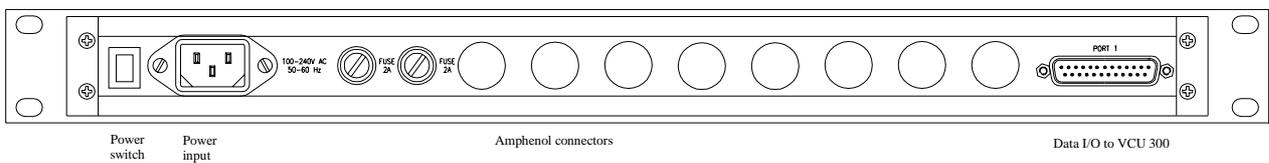


Figure 5 Rear view of the Seatrack Junction Box

3.4 Handheld Terminal description

The Termiflex ST 2000 works as a simple ASCII terminal, capable of simultaneously transmitting and receiving ASCII characters via a RS-232 serial line. Once power is connected, the terminal undergoes a series of self-tests to verify proper unit operation. No input is required during the self-test (approx. three seconds duration).



Figure 6 Handheld terminal

Normally, the HHT will be configured by Seatex before delivery. However, Appendix B "HHT Configuration", gives a description on how to configure the terminal. Operation of the HHT is described in section 4.3.

3.4.1 Handheld Terminal emulator program

Instead of operating the Seatrack 330 units by a handheld terminal, a PC could be used.

The programs "hht.exe" and "WinHHT.exe" use Com 1 on a PC to communicate with the Seatrack 330. Both act like an HHT emulator. The emulator program can only be used on units with RS-232 serial lines. Operation of the HHT emulator program is described in section 4.3. "hht.exe" operates under MS-DOS, "WinHHT.exe" under Windows.

3.5 System description

The drawing below illustrates how the Seatrack 330 units with RS-485 serial lines are used in connection with Seatrack Junction Box, Seatrack VCU 300 and Seadiff.

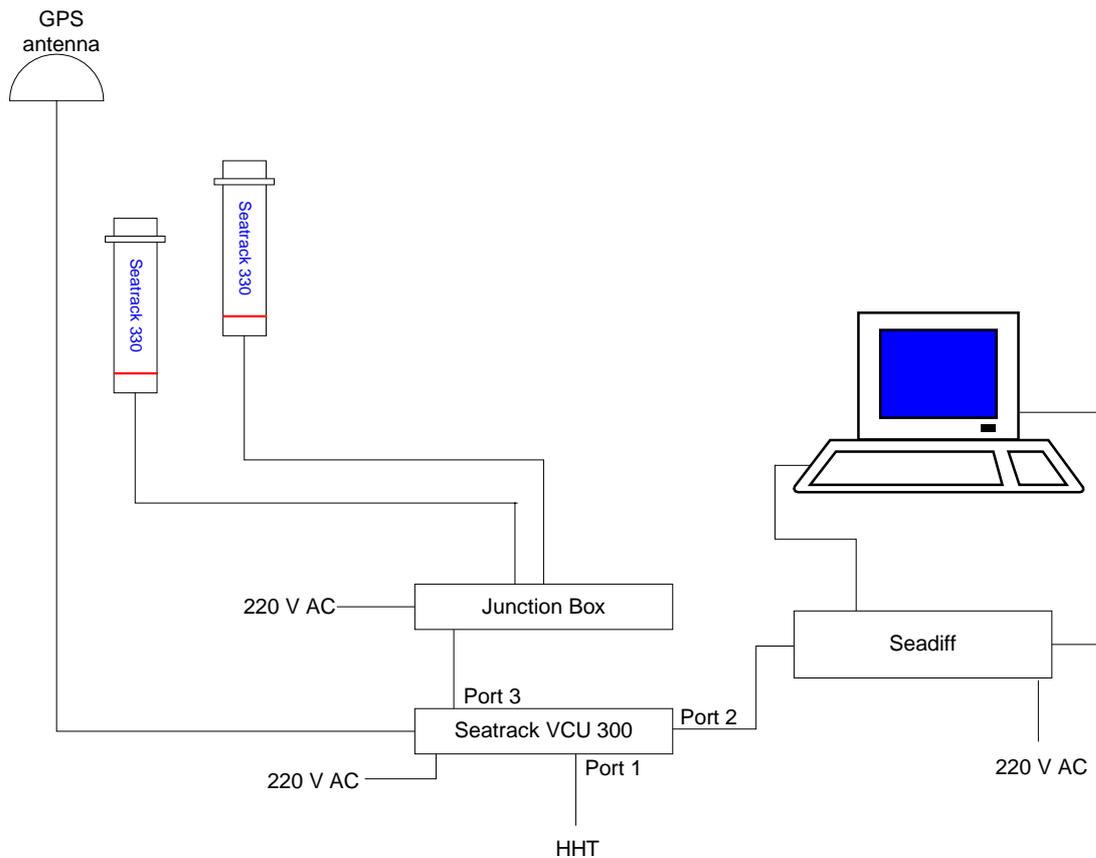


Figure 7 System Description of Seatrack 330 units with RS-485 in connection with Seatrack Junction Box and VCU 300

4 OPERATING INSTRUCTIONS

4.1 Configuration and installation

4.1.1 Seatrack 330 with RS-232

The procedure for configuring the Seatrack 330 unit with RS-232 is as follows:

1. Connect power (9 to 13 V DC) and the HHT. The unit will start automatically when power is connected. The HHT needs external 5 V DC power.
2. Type the password to enter the setup menu. The password is "SEATEX". After the password has been typed, the software version, the unit's identification number (TBID) and the current slot number will be displayed. The TBID is a unique number for the unit and is equal to the serial number.
3. After the information page, a menu page will appear. All operations available in the program are operated from this page, see chapter 4.3 for available functions.
4. To select a page, press the letter in front of the menu text. To return to the menu, press ESC. With the keys T and Y the menu page scrolls up and down.
5. Check, and if necessary change, the following configuration parameters:
 - Period
 - Periodic message

Note A new configuration value will not be stored until you press ENTER. All configuration parameters are then stored in non-volatile memory in the Seatrack 330 unit.

6. After configuration, disconnect power and the HHT. Mount the unit in a hose or a suitable location where the satellite signals will not be obstructed, see Figure 8.
7. The unit will start automatically with the new configuration when power is connected.

4.1.2 Seatrack 330 RS-232 configuration via a PC

1. Connect power (9 to 13 V DC) and a PC to the unit.
2. Start "hht.exe" or "WinHHT.exe" on the PC.
3. Press the character code "ABCDEFGHJIJ" to go from normal data transmittal mode to HHT mode.
4. Type the password to enter the setup menu. The password is "SEATEX". After the password has been typed, the software version, the unit's identification number (TBID) and the current slot number will be displayed. The TBID is a unique number for the unit and is equal to the serial number.

5. After the information page, a menu page will appear. All operations available in the program are operated from this page, see chapter 4.3 for available functions. The pages are the same as when using a HHT, see section 4.1. Configure the unit, see point 4 and 5 in section 4.1.
6. The unit will go back to normal transmittal mode if a character is not pressed within one minute.
7. Terminate the PC program by typing "!".
8. After configuration, disconnect power and the PC. Mount the unit in a hose or a suitable location where the satellite signals will not be obstructed, see Figure 8.
9. The unit will start automatically with the new configuration when power is connected.

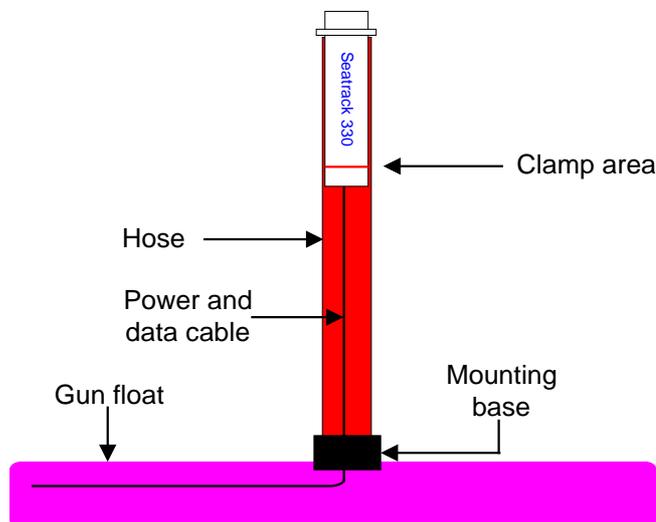


Figure 8 Seatrack 330 installation

4.1.3 Seatrack 330 with RS-485

The procedure for configuring the Seatrack 330 unit with RS-485 is as follows:

1. Connect the Seatrack 330 unit as in Figure 9 with power between 9 and 13 V DC. The unit will start automatically when power is connected. The VCU 300 needs 100-240 V AC.
2. As soon as the unit starts to transmit data, the unit's identification number and slot number will be displayed on Seadiff or equivalent equipment. The unit's ID is a unique number and is equal to the serial number.

3. Check, and if necessary change, the following configuration parameters on the Seatrack 330 unit:
 - Slot number
 - Period
 - Periodic message

Note Slot numbers 12 and 13, and 25 and 0, are reserved for VCUs.

Note A new configuration value will not be stored until the new configuration message is sent to the unit. All configuration parameters are then stored in non-volatile memory in the Seatrack 330 unit.

4. After configuration, if necessary, disconnect power and the serial line to the VCU. Mount the unit in a hose or a suitable location where the satellite signals will not be obstructed, see Figure 8.
5. The unit will start automatically with the new configuration when power is connected.

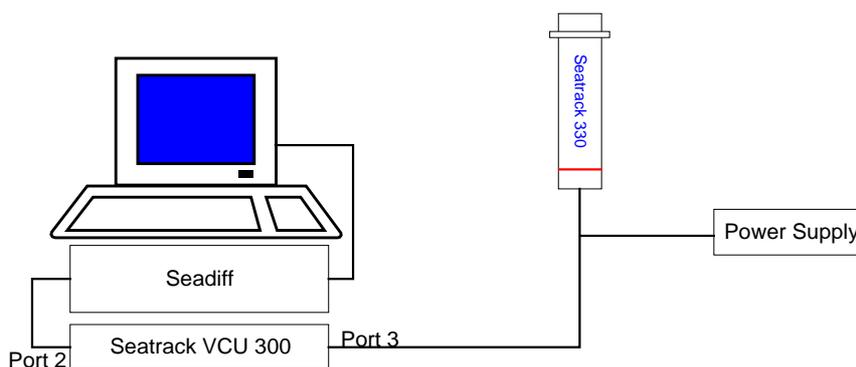


Figure 9 Configuring Seatrack 330 with RS-485 serial line

4.2 VCU 300 configuration and installation

The VCU 300 is designed for indoor installation and should not be exposed to heavy vibrations, transformers or similar. The best location is typically in the instrument room or on the bridge mounted into a 19-inch rack with good ventilation.

1. Mount the VCU in a 19-inch rack.
2. Connect power (100 to 240 V AC).
3. Connect a GPS antenna to the GPS output at the rear of the unit.
4. Start the VCU and the power light will turn on. When data are received and decoded from a Seatrack 330 unit, the RXD indicator light at the front of the VCU will start to flash.
5. Connect a processing unit to port 2 at 9600 baud, no parity, 8 data bits and 1 stop bit. No null modem or crossing of signal lines is required. For pin configuration of port 2, see section 4.4.2.
6. Connect the HHT to port 1 of the VCU.
6. Type the password on the HHT to enter the setup menu. The password is "SEATEX". After the password has been typed, the software version, the VCU's identification number and the current slot number will be displayed.
7. After the information page, a menu page will appear. All operations available in the program are operated from this page, see chapter 4.3 for available functions.
8. To select a page, press the letter in front of the menu text. To return to the menu, press ESC. (Use the SHIFT key before pressing ESC). With the keys T and Y the menu page scrolls up and down.
9. Check, and if necessary change, the following configuration parameters:
 - Slot

Note Slot numbers 12 and 13, and 25 and 0 are reserved for VCUs. The VCUs are default set up with slot number 12.

Note A new configuration value will not be stored until you press ENTER. All configuration parameters are then stored in non-volatile memory of the VCU.

4.3 Configuration functions

Different functions are available via the HHT or the HHT emulator program. An overview is given in the table below.

Page	Content
A	Help
B	GPS*****
C	Communication
D	Time/Battery
E	Slot*
F	Radio Frequency**
G	Radio Mode**
H	Debug
I	Period*****
J	Periodic Message*****
K	Sequence 1*****
L	Sequence 1 Message*****
M	Sequence 2*****
N	Sequence 2 Message*****
O	Port-1 Baud
P	Port-2 Baud***
Q	Port-3 Baud***
R	Reset
S	Backlight on/off
U	AUX Net Mode*****
V	Position Mode*
W	Relay Mode*
X	Log out from HHT

* Not applicable for Seatrack 330 with RS-232.

** Not applicable for Seatrack 330 with RS-232 or RS-485 and VCU 300.

*** Applicable only for VCU 300.

**** Not applicable for VCU 300.

***** Not applicable for Seatrack 330 and VCU 300.

Table 1 Options in the Menu Page

Note When leaving Seatex, all set up and program configuration has been carried out. The unit will start automatically when power is connected. However, slot numbers are random and should be checked before use.

The use of the HHT functions are explained below.

4.3.1 A: Help

This is a help display page.

T	Page up
Y	Page down
ESC	Back to menu
ENTER	Select

In addition to the help keys explained above, the following is important when using the HHT:

- Press the SHIFT key before you use a key with red letters, for example ESC.
- It is not necessary to use the SHIFT key when pressing numbers.
- If you have made a mistake you can press ESC any time.
- Backspace can be used.
- A new configuration value will not be used until you press ENTER. All configuration parameters are then stored in non-volatile memory in the Seatrack 330 unit.

4.3.2 B: GPS

To see if the unit is tracking satellites, select page B. The page will only show the Satellite Vehicle (SV) no. and Signal/Noise (SN) ratio for the six satellites with the highest elevation. It will also show how many satellites the unit is tracking. The unit will only transmit data for the eight satellites with the highest elevation.

A normal display of page B during operation could be as shown below:

GPS-INFO								
SV	30	12	06	13	24	20	- list of tracked satellites	
SN	15	14	14	13	12	12	- list of signal/noise ratio	
No. Sat.	9	GPS Time: 223098.00						- number of tracked satellites and GPS time in seconds

Page B is also used as a status indicator page. For instance, if the GPS receiver has started set up, but no satellites are tracked, the page will look as below :

GPS-INFO	
No GPS data!	- status code information
Status code: 3	

The following status code may be displayed:

- 0: GPS receiver waiting for power.
- 1: GPS receiver no set up.
- 2: Illegal GPS receiver.
- 3: GPS receiver set up start, too few satellites tracked.
- 4: GPS receiver set up done, too few satellites tracked.
- 5: GPS data received (the page will change to showing satellites and signal-to-noise ratio as described above).
- 6: The unit is in Transparent mode.
- 7: The unit is in Position mode.

4.3.3 C: Communication

When the Seatrack 330 unit is sending messages, page C displays the time since the last transmitted or received messages. The following text could be displayed on page C:

UHF RX	None		- No messages received on UHF
SER RX	9	2 s ago	- Message 9 received on serial line 2 seconds ago
UHF TX	None		- No messages transmitted on UHF
SER TX	9	2 s ago	- Message 9 transmitted on serial line 2 seconds ago

4.3.4 D: Time/battery

After power up, the following text could be displayed on page D:

TIME / BATTERY		
Invalid Time:	00:01:26	- hours, minutes and seconds since booting
Batt. In:	12.3 V	
Batt. Out:	12.1 V	
Temp:	24.5 C	

When the processor is synchronised with the GPS time, "GPS-time" will appear instead of "Invalid Time".

4.3.5 E: Slot

Note Only Seatrack 330 units with RS-485 serial lines that are connected to a VCU 300 and VCU 300 units need to be set up with slot numbers.

Slot numbers on Seatrack 330 units are set via Seadiff or equivalent equipment. Slot numbers on VCU 300 units are set via HHT.

Choose page E to change slot numbers from the HHT. Select the wanted slot number and press ENTER to store the configuration.

Default value: Not defined. Any number can be set from factory.

Note Select a unique slot number for each Seatrack unit. Slot numbers between 0 and 25 can be used when the update rate is 0.5 Hz. The slot numbers 12 and 13 and 25 and 0 are reserved for the VCUs.

Note When using Periodic Message Type 2, two slot numbers beside each other can not be used. The message needs two slots to transmit all data.

If two units are accidentally assigned to the same timeslot, data will be lost. If one unit has a much stronger signal, e.g. has shorter range, it may be received correctly but will mask the data from the weaker unit. If the signal strengths are similar, data from both units will be corrupted.

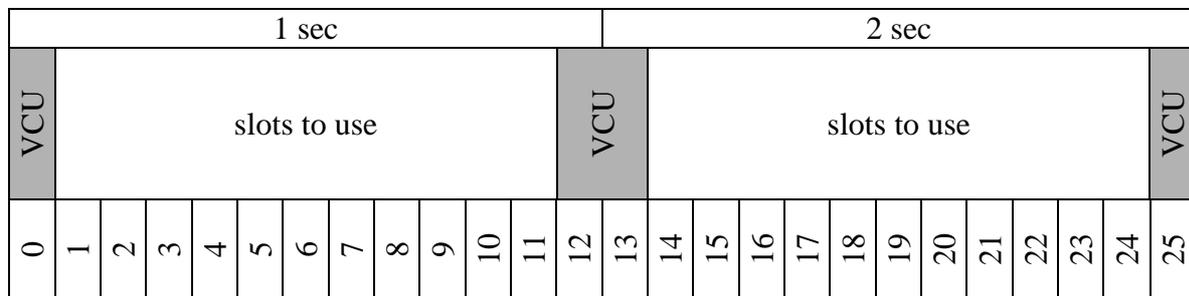


Figure 10 Slot description

Example

Eight Seatrack 330 units with RS-485 serial lines shall transmit raw data, message type 2, at 0,5 Hz.

The configuration of the units would be as follows:

All units: Periodic Message Type: J = 2
 Period: I = 2

Slot numbers:

Unit	1	2	3	4	5	6	7	8
Slot number	2	4	6	8	14	16	18	20

4.3.6 H: Debug

This page is for debug purposes only. The following debug functions are available:

- 0 = No debug
- 1 = Debug printouts can be seen on HHT.
- 2 = Debug printouts are sent to COM1.

- 4 = UHF TX debug. The radio will transmit the character X continuously. This function can be used to check the radio frequency and power.
- 8 = COM2 debug. All character input from HHT is sent to COM2 TX. All characters received on COM2 RX are presented on HHT.
- 16 = Turn relay 1 on.
- 32 = Turn relay 2 on.
- 64 = PPS debug. A "!" is printed each time a PPS interrupt occurs.
- 128 = Communication debug printouts.
- 256 = Cycle slip debug printouts.

Note Combinations of the above can/must be used. For example: To see the PPS printouts on HHT: Select debug function 65 (64+1).

Press ESC to terminate the debug mode. All debug flags will then be reset.

Default value: 0

4.3.7 I: Period

The update rate of transmitted messages.

Period values:

- 0 = Power save on: no periodic message will be sent.
- 1-12 = Period in seconds: the period is rounded to 1, 2, 3, 4, 6 or 12 seconds. If 5, 7, 8 or 9 is selected, period value will be 6. If 10 or 11 is selected, period value will be 12.

Default value: 1

4.3.8 J: Periodic message type

Specify the message type to be sent periodically:

- 0 = No periodic message transmission.
- 2 = GPS raw data: this message contains the number of satellites, a time tag and a set of data from each satellite.
- 3 = IRMA data: TBD
- 4 = Configuration: this message contains configuration data from the unit.
- 5 = Status: this message contains CPU and GPS software version information, voltage and temperature measurements together with relay status information.
- 6 = ECEF Position: this message contains ECEF position and PDOP information.
- 9 = Standard message

- 10 = MX9400 format.
 11 = Ashtech transparent mode.

Default value: Customer dependent

Note To use Ashtech transparent mode, change periodic message type to 11, disconnect power and connect power again. Connect the unit to a PC with a terminal program. Set up the terminal program to 9600 baud, no parity, 8 data bits and 1 stop bit. To communicate with the unit, use Ashtech commands.

4.3.9 K, M: Sequence 1,2

The sequences make it possible to send more than one message type periodically. A sequence counter is incremented each time the periodic message is being transmitted. When the counter equals the specified value, the sequence message is transmitted instead of the periodic one. The counter is then zeroed.

Default value: 0

4.3.10 L, N: Sequence 1,2 message type

Specify the message type to be sent instead of the periodic one.

- 0 = No sequence message transmitted.
 2 = GPS raw data: this message contains the number of satellites, a time tag and a set of data from each satellite.
 3 = IRMA data: TBD.
 4 = Configuration: this message contains configuration data from the unit.
 5 = Status: this message contains CPU and GPS software version information, voltage and temperature measurements together with relay status information.
 6 = ECEF Position: this message contains ECEF position and PDOP information.
 9 = Standard message
 10 = MX9400 format.
 11 = Ashtech transparent mode.

Default value: 0

Example

A unit shall send raw data at 0.5 Hz, position data every minute and battery voltage once every five minutes.

The configuration would be as follows:

Period = 2	0.5 Hz
Periodic Message Type = 1	Raw Data
Sequence 1 = 30	Once every minute (Period * Sequence 1 = 2 * 30 = 60)

Sequence 1 Message Type = 6 ECEF Position
Sequence 2 = 150 Once every five minutes (Period * Sequence 2 = 2 * 150
 = 300)
Sequence 2 Message Type = 5 Status

4.3.11 O, P, Q: Port-1-3 baud

The baud rate for the serial ports can be selected according to the following table:

0 =	300 baud
1 =	600 baud
2 =	1200 baud
3 =	2400 baud
4 =	4800 baud
5 =	9600 baud
6 =	19200 baud
7 =	38400 baud

Use values in the range 4-6.

Default value: 5

4.3.12 R: Reset

Select between the following reset values:

1 =	Reset CPU: the CPU will be reset and the GPS will go through a power off, power on sequence.
2 =	Reset GPS receiver only.
3 =	Reset GPS memory.

4.3.13 S: Backlight on/off

Press S to turn HHT backlight on/off.

4.3.14 V: Position mode

0 = OFF
 1 = ON, the Seatrack 330 unit transmits NMEA messages via serial line disregarding the current set-up which includes e.g. timeslot, period and message type. If the unit receives RTCM messages, it will use these to compute a differential position. It is also possible to specify which NMEA messages to transmit and configuration parameters for the GPS receiver via this page.

RTCM INPUT MODE

0: Proprietary, default, differential corrections are transmitted in message type 35.
 1: RAW, differential corrections are transmitted raw on a serial port. Message type 35 is not used. If using a HHT this must be done within 60 seconds after POWER ON. After 60 seconds, logon with HHT is not possible.

Max RTCM Age:

1 – 1199: Default = 60, maximum age of differential corrections to be used (in seconds).

Reference Station ID:

0 – 1023: Default = 0, if 0 is chosen, any reference station it receives corrections from is used.

GGA: 0: OFF
 1: ON, default.

GSA: 0: OFF
 1: ON, default.

RRE: 0: OFF
 1: ON, default.

Elevation Mask:

0 – 99: Default = 10, elevation mask for position computation (not raw data).

PDOP Mask:

0 – 99: Default = 6

HDOP Mask:

0 – 99: Default = 4

VDOP Mask:

0 – 99: Default = 7

2D Mode:

0: Auto, default.
1: Manual

Altitude:

0 – 99999.99 Default = 0

Default value: 0

4.3.15 W: Relay mode

0: Manual, default.
1: Timer, the relay changes mode if the unit receives messages.

Relay 1 Default value:

0: OFF, default
1: ON

Relay 1 Timeout value:

1 – 32000 seconds

Corresponding configuration can be set for Relay 2. Relay 1 and Relay 2 may be set independently.

Default value: 0

4.3.16 X: Log out from HHT

Press X to log out from HHT.

4.4 Pin configuration

4.4.1 Seatrack 330

Standard connector, QXA 4/12 male, pin configuration:

The Seatrack 330 unit can be delivered as RS-232 or RS-485:

RS-232 Pin Configuration

Pin no.	Signal	Comments
1	TX	RS-232
2	RX	RS-232
3	+ 9-13 V DC	
4	GND	Power and signal ground

RS-485 Pin Configuration

Pin no.	Signal	Comments
1	TX- or RX-	RS-485
2	TX+ or RX+	RS-485
3	+ 9-13 V DC	
4	GND	Power and signal ground

Optional connector, AGM-17x4F, pin configuration:

Pin no.	Signal	Comments
1	+ 9-13 V DC	
2	TX	RS-485
3	GND	Power and signal ground
4	RX	RS-485

4.4.2 VCU 300

Port 1: 9-pin D-sub RS-232 for HHT

Pin no.	Signal	Comment
1	5 V DC	Power to HHT
2	RX	
3	TX	
5	GND	

Port 2: 25-pin D-sub RS-232 for communication with Seadiff or other device. When using Seadiff an external spidercable with two connectors are delivered. One input is for the PPS signal, the other for communication between Seadiff and the VCU.

Port 2 RS-232

Pin no.	Signal	Comment
2	RX	Input data to Seatrack 330 units
3	TX	Output data from Seatrack 330 units
7	GND	
18	PPS	Input external PPS signal if no internal GPS receiver
25	PPS GND	Input external PPS signal if no internal GPS receiver
10	RX	Input data to internal GPS receiver
11	TX	Output raw GPS data from internal GPS receiver
23	GND	

Spider cable connected to Port 2

To be compatible with Seatrack VCU 200 and its communication ports, a spider cable is delivered together with the VCU 300. Port 2 on the VCU 300 are equal to Port 2 and Port 3 on a VCU 200. The connector marked "RS-232" on the spider cable, is equal to Port 3 on a VCU 200, while the connector marked "GPS" is equal to Port 2 on a VCU 200.

Connector marked "RS-232"

Pin no.	Signal	Comment
2	RX	Input data to Seatrack 330 units
3	TX	Output data from Seatrack 330 units
7	GND	
18	PPS	Input external PPS signal if no internal GPS receiver
25	PPS GND	Input external PPS signal if no internal GPS receiver

Connector marked "GPS"

Pin no.	Signal	Comment
10	RX	Input data to internal GPS receiver
11	TX	Output raw GPS data from internal GPS receiver
23	GND	

Port 3: 25-pin D-sub RS-485 for communication with up to eight Seatrack 330 units.

Port 3 RS-485

Pin no.	Signal	Comment
1	Data -	Unit 1
14	GND	Unit 1
2	Data +	Unit 1
15	Data -	Unit 2
3	GND	Unit 2
16	Data +	Unit 2
4	Data -	Unit 3
17	GND	Unit 3
5	Data +	Unit 3
18	Data -	Unit 4
6	GND	Unit 4
19	Data +	Unit 4
7	Data -	Unit 5
20	GND	Unit 5
8	Data +	Unit 5
21	Data -	Unit 6
9	GND	Unit 6
22	Data +	Unit 6
10	Data -	Unit 7
23	GND	Unit 7
11	Data +	Unit 7
24	Data -	Unit 8
12	GND	Unit 8
25	Data +	Unit 8

Data + is either TX+ or RX+, while Data - is either TX- or RX-.

4.4.3 Junction box

The figure below illustrates the internal wiring in the Seatrack Junction Box. The Junction Box houses four power supplies, each power supply rated to drive two Seatrack 330 units. Data input from the Seatrack 330 units is transferred to port 1 in the box. This port shall be connected to port 3 on the Seatrack 300 VCU with a one-to-one cable. The power supplies inside the Junction Box are powered by 110-240 V AC.

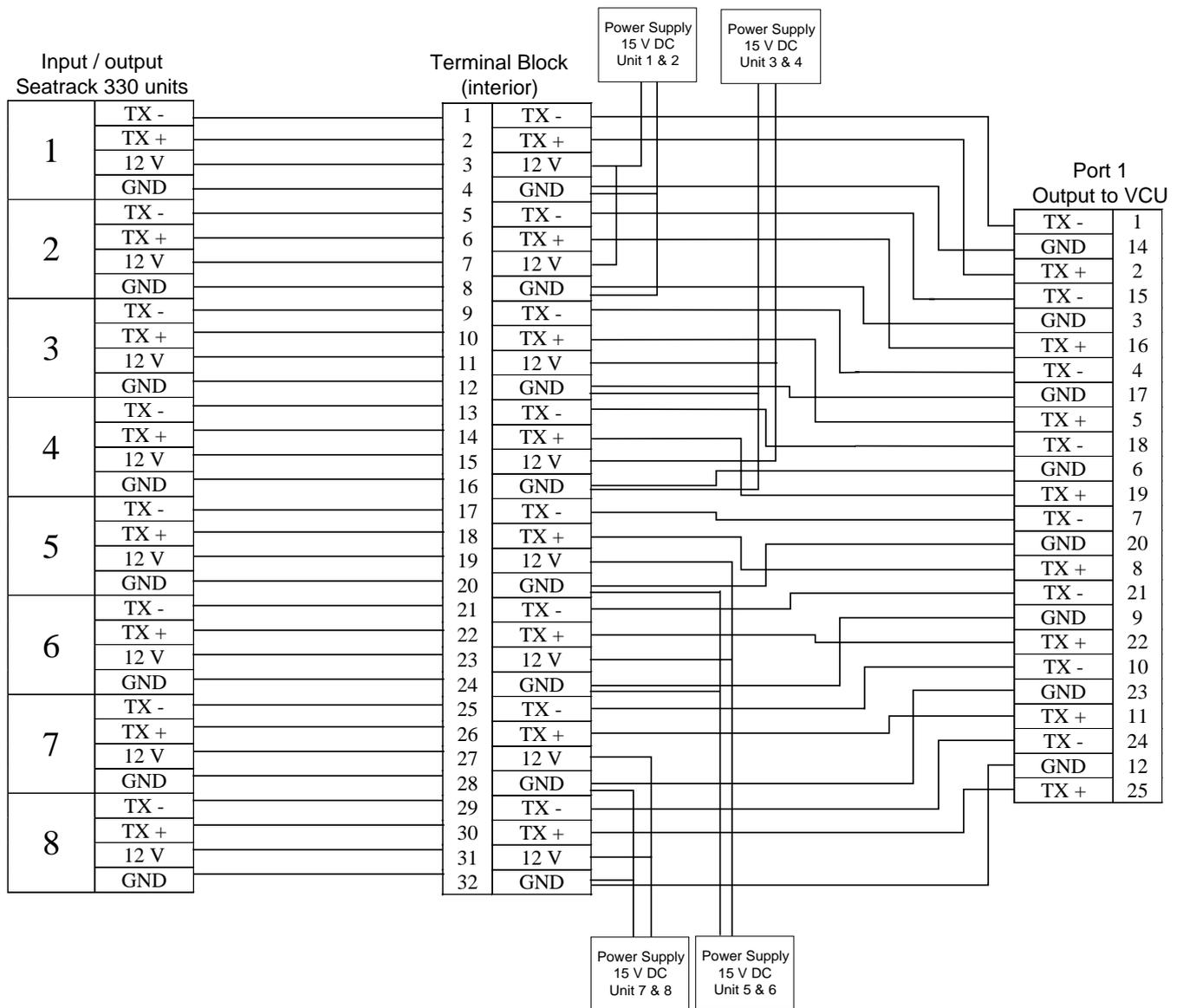


Figure 11 Internal wiring Seatrack Junction Box

External Amphenol connector 4-pin male

Pin no.	Signal	Comment
1	TX -	Output data from Seatrack 330 unit
2	TX +	Output data from Seatrack 330 unit
3	12 V	Power to Seatrack 330 unit
4	GND	

TX- and TX+ can also be RX- and RX+ if data is sent to the Seatrack 330 unit, e.g. during configuration.

5 TROUBLESHOOTING

This part of the document is written for personnel with operator experience when a situation arises where assistance from service personnel may be required. The aim of this section is to identify the problem so that appropriate action can be taken.

5.1 Hardware troubleshooting

5.1.1 No booting

- Turn the power OFF by removing the power cable. Wait a few seconds before reconnecting the power cable. The power connectors may be hard to mate and disconnect.
- Check that the power supply outputs correct voltage (9 - 13 V DC).
- If still no booting, contact Seatex.

5.1.2 Communication problems

- Check that the Seatrack 330 units and the Seatrack VCU 300 are correctly configured, see section 4.1.
- Data transmission will not occur if the GPS receiver loses time synchronisation. Reset the GPS receiver, see section 5.1.3 below, on both the VCU and the Seatrack 330 unit.

5.1.3 No position fix/no GPS data

- Turn the power OFF/ON to restart the GPS receiver by removing the power cable. The power must be OFF for more than five seconds before the unit is re-powered!
- Reset the GPS receiver by pressing the button **R** and select 2 on the terminal, see section 4.3.12. If the unit has been transported over long distances, this often reduces the time before the first position fix.

5.2 Seatrack 330 unit repair

CAUTION

The Seatrack 330 units are not designed for service in the field. All repairs and modifications of the units, except for installation of new software versions and setup of the system, have to be done by Seatex. Failed units shall be shipped back to Seatex for repair.

Note When leaving Seatex, the Seatrack 330 unit is prepared for use, and filled with nitrogen. The unit must not be disassembled unless nitrogen is available to insert after service.

However, if repair is necessary the below procedure shall be followed:

1. All work shall be carried out in a cool, dry atmosphere. The unit shall not be opened until it is fully adjusted to room temperature.
2. To dismantle the unit, remove all of the screws which pass through the sides of the case.
3. Drag the inner pipe and bottom plate out of the housing.
4. Dismantle the inner pipe from the bottom plate by removing the screws.
5. Remove the discs of damping material on top of the steel cylinder.
6. Unscrew the guide bar and remove the steel cylinder from the inner pipe.
7. Disconnect the cable and remove the rest of the damping material.
8. Open the steel cylinder by removing all the screws on top and bottom of the cylinder. Remove the electronics and the antenna out of the steel cylinder.
9. Repairs should be limited to exchanging modules between a pair of faulty units. It is not possible to repair individual electronic modules.

5.3 Assembling Seatrack 330 after repair

1. Place the steel cylinder with the electronics inside the inner pipe.
2. Take the cable through the four discs of damping material.
3. Connect the cable.
4. Push the cylinder and the discs into the inner pipe.
5. Make sure the cable is not squeezed between the cylinder and the damping material.
6. Fasten the guide bar.
7. Place four discs of damping material on top of the antenna.
8. Fasten the inner pipe to the bottom plate.

9. Check o-ring.
10. Press the inner pipe into the housing.
11. Fill with nitrogen before closing the unit.

Appendix A - Illustrations

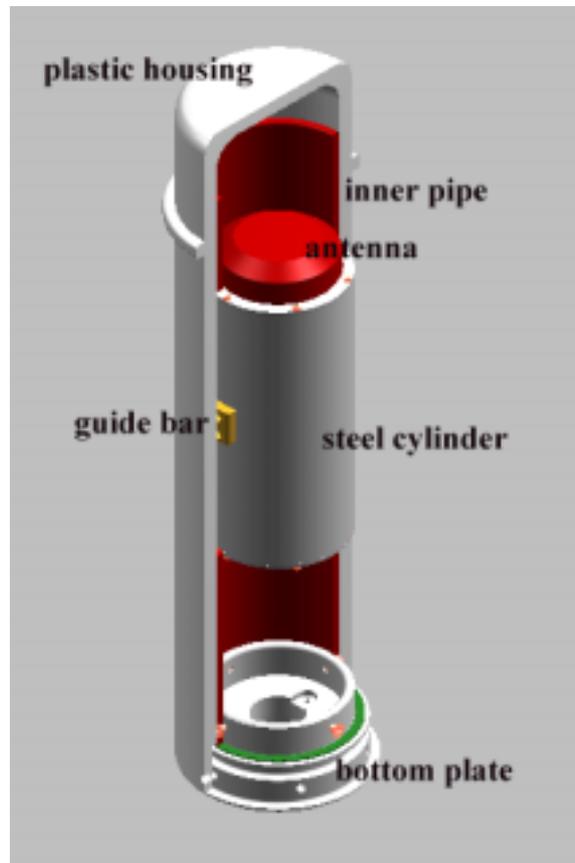


Figure 12 Assembly drawing of Seatrack 330

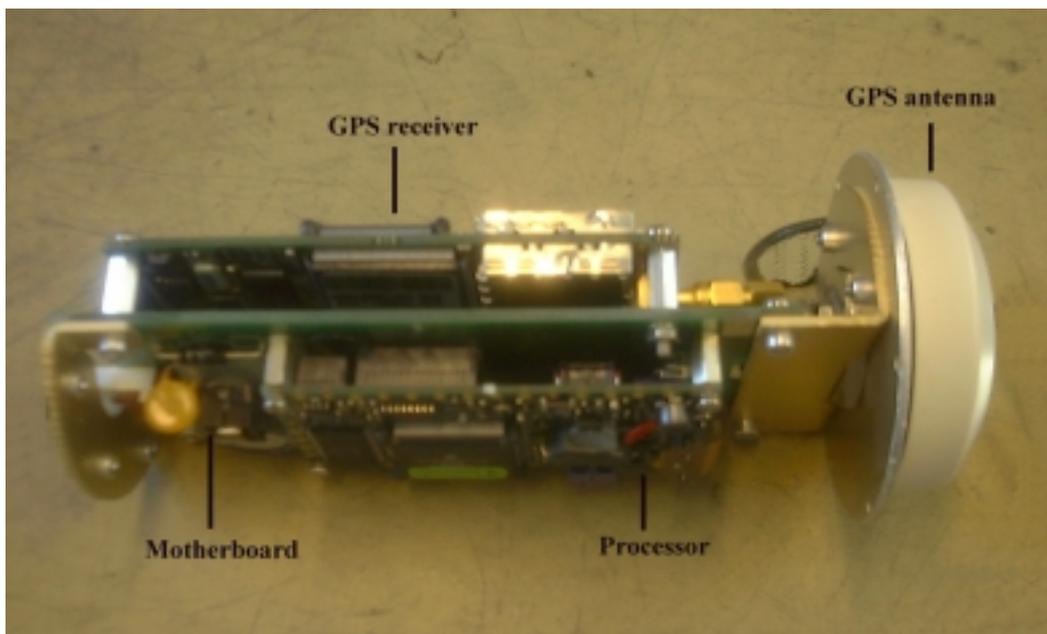


Figure 13 The electronics inside the Seatrack 330 unit

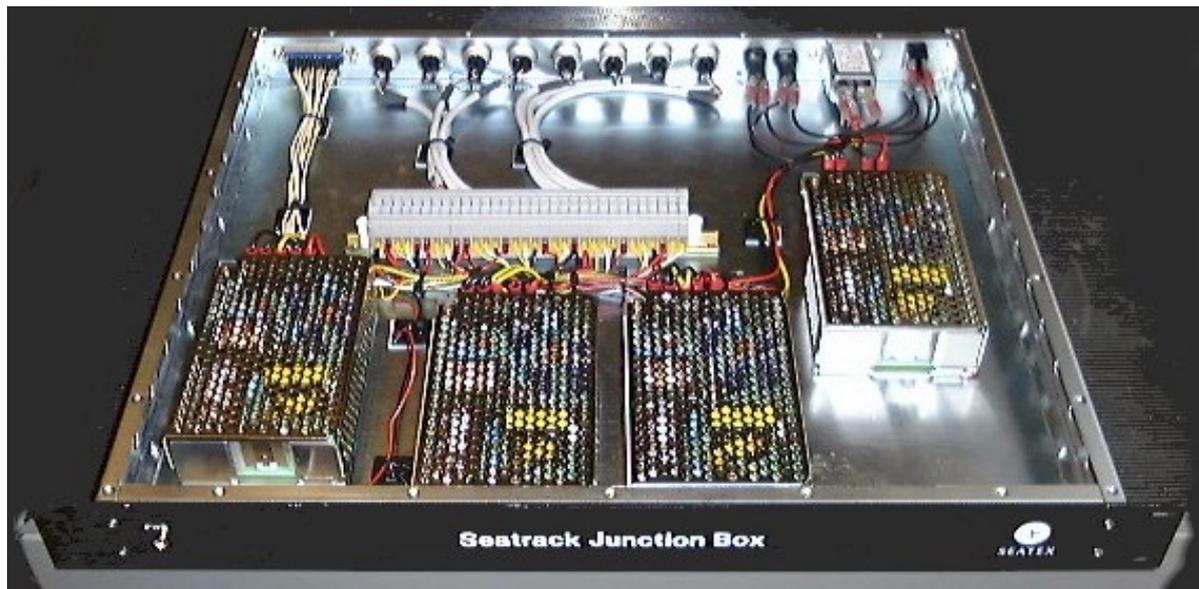


Figure 14 Front of the Seatrack Junction Box



Figure 15 Rear of the Seatrack Junction Box

Appendix B - HHT Configuration

The terminal setup mode is entered by pressing the lower left and lower right keys (**Z** and **ENTER**) while the unit undergoes the power up self-test. While in setup mode, incoming data are ignored.

When The Main Menu is entered, the text "MAIN MENU" will be shown on the top display line and the soft key labels "COM DSP KBD EXIT" will be shown on the bottom line. Switch between the different options be pressing **NXT** or **PRV**. All parameters must be set up as listed Table 2.

Communication (COM) Setup:

Baud rate	9600
Parity	NONE
Data, Stop bits	8,1
Display serial errors ?	YES
Aud serial errors ?	NO
Support XON/XOFF ?	NO

Display (DSP) Setup:

Disp ctl chars ?	NO
Disp esc chars ?	NO
Cursor visible ?	YES
Auto line wrap ?	YES
New line on cr ?	NO
Display self-test ?	YES
Backlight on ?	YES
Backlight strength ?	OPTIONAL

Keyboard (KBD) Setup:

Local echo ?	NO
Key repeat	SLOW
Audible keys ?	YES
Simplified KB ?	NO
Program function key F1?	< MAIN >
Exit the Main Menu by pressing	< EXIT >.
Save Changes ?	YES
Leave the Setup by pressing	<EXIT>

Table 2 Handheld Terminal Configuration Parameters

Appendix C – Part number list

Tailbuoy transponders

G710-03	Seatrack 220	12p data/power
G710-04	Seatrack 220	8p data + 4p power

Gunfloat transponders

G720-03	Seatrack 320	8p data + 4p power
G720-04	Seatrack 330	Standard, power pigtail
G720-05	Seatrack 330	RS-485, power pigtail
G720-06	Seatrack 330	Standard, 4p connector
G720-07	Seatrack 330	RS-485, 4p connector

VCU

G700-02	Seatrack 200 VCU	
G700-20	Seatrack 300 VCU	With GPS receiver, RS-485
G700-41		Seatrack splitter cable for GPS and data interface

Cables

G700-42	Seatrack power cable for G710-04, 6m
G700-43	Seatrack power and data cable for G710-03, 6m
G700-44	Seatrack power cable for G720-06 and G720-07, 6m

Terminals

G700-45	Handheld terminal for G710-04
G700-04	Handheld terminal for G700-02, 9-pin d-sub

Antenna

G060-08	UHF antenna
---------	-------------

Appendix D – Firmware upgrade

To download new firmware, a PC with DOS and the downloading utility program `sc3load.exe` together with a 9-pin DSub cable or a 25 to 9-pin DSub cable is needed.

1. Connect com1 on the PC to com1 on the Seatrack 330 unit with the 9-pin DSub cable. For the Seatrack VCU units, connect com1 on the PC to port 3 at the rear of the VCU with the 25 to 9-pin DSub cable.
2. Start the downloading utility program "`sc3load.exe`" from a DOS prompt by typing:
`sc3load sc3xxx.0` (`sc3xxx.0` is the name of the new software file and `xxx` is the version number. E.g. version 1.56 will be named `sc3156.0`).
3. Turn power on the unit.
4. Press "Y" if the `sc3load` program asks if you want to download new firmware. The program will now start to download the firmware.
5. If "`sc3load.exe`" will not download the new file, carry out step 2 again and try to power cycle the Seatrack unit after starting "`sc3load.exe`".

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